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Research Article

Prevalence of Depression and Anxiety in Patients with Obstructive Lung Disease and Correlation with Spirometry

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Abstract: Background: Occurrence of respiratory symptoms with everyday life, including simple home chores or even walking, causing depression and anxiety. Asthma and chronic obstructive pulmonary disease (COPD) are common chronic lung diseases in Pakistan. However, local literature is scarce regarding depression and anxiety prevalence.

Objective: To determine depression and anxiety prevalence in obstructive lung diseases, including asthma and COPD, and explore its correlation with spirometry.

Materials and Methods: This cross-sectional study was conducted at the outpatient clinics of Pulmonology, Indus Hospital & Health Network Karachi, from January 2025 to May 2025. The Patient Health Questionnaire-9 (PHQ-9) and General Anxiety Disorder-7 (GAD-7) were used to measure depression and anxiety, respectively. Spirometry evaluation included forced expiratory volume in the first second (FEV1), forced vital capacity (FVC), and the FEV1/FVC ratio.

Result: A total of 118 participants were included with a mean age of 50.6 ± 6.8 years. Most of the patients were females (54.4%). Asthma and COPD were seen in 64.4% and 35.6%, respectively. Prevalence of depression and anxiety in COPD patients was 90.5% and 62%, respectively. While the prevalence of depression and anxiety in asthma patients was 85.5% and 59%, respectively. Asthma and COPD patients did not differ on the basis of depression and anxiety prevalence. For asthma patients, there was no significant correlation of depression and anxiety score with lung function. For the COPD cohort, no significant correlation was found between lung function and anxiety score. In COPD patients, a significant weak negative correlation was seen for depression score and FEV1% (r=-0.319, p=0.040), FVC (r=-0.411, p=0.007), and FEV1/FVC ratio (r=-0.345, p=0.025).

Conclusion: Anxiety and depression are common in people with obstructive lung disease who also have asthma or COPD. This result emphasizes the necessity of routinely screening for anxiety and depression in order to alleviate the psychological burden among patients with COPD and asthma. Furthermore, a strong inverse link between depression and lung function measures highlights the need for continuous treatment plans to take psychological factors into account in order to enhance COPD therapy.

Keywords: Asthma, Anxiety, Chronic obstructive lung disease, Depression, Mental Health, Pulmonary disease.

INTRODUCTION

Obstructive lung diseases are characterized by fixed or variable reductions in expiratory airflow, which include asthma and chronic obstructive pulmonary disease (COPD) [1, 2]. These diseases are commonly encountered and often present an airway disease that is complex and heterogeneous [3]. Unarguably, COPD, which affects about 12.6% of the population worldwide, presents a significant contribution to the morbidity and mortality [4]. The prevalence of COPD worldwide increased from 5.4% in 2000 to 9.8% in 2019 [5]. COPD and asthma are recorded to be present in 2.1% and 4.3% of the population in Pakistan, respectively [6]. Both diseases are present in the primary healthcare domain daily, constituting at least a quarter of the total disease burden encountered [7].

Patients usually experience symptoms indicative of respiratory illness: cough, wheezing, and exertional dyspnea, which possibly suggest chronicity and mortality [8]. Along those lines, such conditions would carry a psychological burden consistent with the biopsychosocial paradigm of chronic illness [9]. When respiratory symptoms such as dyspnoea, coughing, or wheezing start to interfere with day-to-day activities such as household chores or even walking, this can lead to feelings of helplessness. Chronic allergic attacks in day-to-day surroundings and drug dependency also make them understand that they cannot do things like ordinary people, and overall this situation causes depression psychologically.

Sudden and unexpected asthma attacks can lead to anxiety and depression. Individuals who develop asthma are three-fold more likely to develop internalizing disorders, i.e., anxiety and depression, when compared to individuals without asthma during development [10]. In severe asthma, according to a study, an average prevalence of 27% was reported for emotional distress,

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primarily because of anxiety and depression [11]. Conversely, in contrast to the general population, individuals with COPD experience higher incidences of depression and anxiety. Based on Atlantis *et al.*, the relative risk of COPD patients developing depression is 1.69 in comparison to non-COPD [12]. In comparison to other chronic comorbid diseases, even patients with COPD are reported to have higher incidences of depression and anxiety [13].

Spirometry is a dependable diagnostic instrument for patients with asthma and COPD to determine the extent of their lung function. Spirometry assessments provide every different narrative parameter, such as FEV1, FVC, or FEV1/FVC ratio, which reveals airflow limitation and disease severity [14]. Patients also experience psychological stress knowing their lung capacity and breathing limitation can result in depression and anxiety. A review with 1,161,632 individuals highlighted the benefits of keeping a moderate or high pulmonary fitness level to prevent depression [15]. It remains unknown if impaired lung function (FVC and FEV1) can be a direct risk factor for depression.

Co-occurrence of anxiety disorders is also common among patients with depression. This occurs as a result of shared symptoms between both diagnoses, and overlapping symptoms serve as what has been referred to as “bridges” where symptoms activate overall symptoms between disorder clusters of both illnesses [16]. Anxiety and depression can be separated for reliable assessments; however, simultaneous assessment for both is vital, as symptoms overlap overall and may complicate the patient’s disease. With this simultaneous assessment, a reliable differentiation can be made between either diagnosis, which makes treatment applicable to the individual situation and benefits the patient’s mental health and overall quality of life.

Asthma and COPD are prevalent chronic respiratory diseases in Pakistan that affect not only physical health but mental health as well [17]. Pakistan is a lower-middle-income country where even the general populace suffers with depression as a result of monetary constraints [18]. Thus, having a lung disease, the need for treatment and medication, and regular hospital attendance compound their financial burden; simultaneously, patients worry about their limited issue with breath. This ultimately puts patients of lung disease at high risk for depression. While several international studies have evaluated depression and anxiety among COPD and asthma patients, there continues to be a lack of local literature. In light of available data, it may be hypothesized that a significant number of asthma and COPD patients suffer with depression and anxiety. Therefore, we planned the current study to evaluate depression and anxiety in obstructive lung disease (asthma and COPD) and to evaluate its correlation with spirometry.

MATERIALS AND METHODS

This cross-sectional study was conducted at the outpatient clinics of Pulmonology, Indus Hospital & Health Network Karachi, from January 2025 to May 2025. The study was approved by the Institutional Review Board bearing letter number IHHN_IRB_2024_03_018, dated December 13, 2024. All patients with asthma or COPD patients of age 18 to 75 years of either gender were included. Patients with active malignancy, any active respiratory infection, a confirmed diagnosis of anxiety and depression, or taking medications for any underlying psychiatric disorders were excluded.

An online calculator was used to perform the sample size calculation. A sample size of 118 patients was estimated, taking 13.65% prevalence of depression in COPD [18] at a 95% confidence interval and a 6.3% margin of error. Patients visiting the clinic and waiting for their turn were approached for participation with their written informed consent following the non-probability sampling technique.

Trainee physicians conducted anxiety and depression screenings. Depression was measured using the Patient Health Questionnaire-9 (PHQ-9). The nine-item PHQ-9 screening test is also frequently used as a diagnostic tool. The response is scored between 0 and 27 on a scale of 0 (not at all) to 3 (almost every day). There are five unique categories for the score: no depression (score <5), minimal depression (score 5–9), moderate depression (score 10–14), moderately severe depression (score 15–19), and severe depression (score >20) [19].

The General Anxiety Disorder-7 (GAD-7) assessment was used to screen for anxiety. The seven items on the GAD-7 have a 4-point Likert scale, with 0 denoting "not at all" and 3 denoting "nearly every day." The range of the total score is 0–21. A score of 0–4 is considered minimal, a score of 5–9 is considered mild, a score of 10–14 is considered moderate, and a score of 15–21 is considered severe anxiety [20].

Lung function capability was assessed using spirometry in terms of Forced Expiratory Volume in the first second (FEV1), Forced Vital Capacity (FVC), and FEV1/FVC ratio. The spirometry test was conducted by a skilled technician with at least five years of experience. Patients were instructed to aggressively exhale twice or three times for six seconds. If the first two blows differed by at least 5%, a third blow was delivered. Maximum values of FEV1 and FVC were converted into percent predicted using the Global Lung Function Test Initiative's updated guidelines [21].

STATISTICAL ANALYSIS

Data was analyzed using IBM SPSS statistics 27.0. Categorical variables were expressed as frequency and percentage. Numerical variables were first subjected to normality assumption using Shapiro-Wilk test. Variables were found to be normally distributed with Shapiro-Wilk $p>0.05$ and summarized as mean ± standard deviation, otherwise expressed as median with inter-quartile range (IQR). Spearman correlation was applied. P-values ≤ 0.05 was deemed as statistically significant.

RESULT

A total of 118 participants were included in the study with a mean age of 50.6 ± 6.8 years. Almost half of patients were males

(45.8%) and females (54.4%). Around two-thirds of patients had asthma, and the remaining had COPD. Few patients were currently smoking (2.5%). Table **1** displays a summary of patients' features.

Table 1. Descriptive Statistics for Patients' Features.

Variables	Groups	Frequency	Percentage
Gender	Female	64	54.2
	Male	54	45.8
Education	Graduate	10	8.5
	Nil	31	26.3
	Primary	47	39.8
	Secondary	30	25.4
Marital Status	Married	108	91.5
	Unmarried	10	8.5
Lung Disease	Asthma	76	64.4
	COPD	42	35.6
Smoking Status	Active	3	2.5
	Ex-smoker	31	26.3
	non-smoker	84	71.2

Overall mean FEV1 predicted was 48.7 ± 18.4% with a range of 14-89. Average FVC was 61.5 ± 17.1. The range of FVC was 24-98. The mean FEV1/FVC ratio was 64.3 ± 13.1. The range of FEV1/FVC ratio was 36-96. Table **2** shows spirometry analysis between asthma and COPD patients.

Table 2. Spiromtery Analysis among Asthma and COPD Patients.

Lung Disease	Statistics	FEV	FVC	Ratio
Asthma	n	76	76	76
	Mean	51.56	63.86	66.39
	Std. Deviation	18.42	16.45	12.54
	Minimum	14.00	24.00	38.00
COPD	n	42	42	42
	Mean	54.73	72.85	75.15
	Std. Deviation	17.44374	17.55105	13.51648
	Minimum	14.00	28.00	36.00
	Maximum	86.00	98.00	96.00

Depression scores showed comparable patterns across groups, with moderate depression being the most frequent category in both asthma (41%) and COPD (45%) patients. Mild, moderately severe, minimal, and severe depression followed in similar proportions, and no significant association was observed between diagnosis and depression categories (p=0.963) (Table **3**).

The distribution of anxiety and depression scores did not differ significantly by diagnosis. For anxiety, minimal and mild anxiety were more prevalent in asthma patients (59% and 25%, respectively), whereas COPD patients had higher rates of mild anxiety (43%) and lower rates of minimal anxiety (38%). Moderate and severe anxiety was relatively less common in both groups.

Table 3. Association of Diagnosis Tab with Anxiety and Depression.

Characteristic	Asthma n(%)	COPD n(%)	p-value
Depression Score			
Minimal Depression	11 (14)	4 (9.5)	0.963
Mild Depression	18 (24)	9 (21)	
Moderate Depression	31 (41)	19 (45)	
Moderately Severe Depression	14 (18)	8 (19)	
Severe Depression	2 (2.6)	2 (4.8)	
Anxiety Score			
Minimal Anxiety	45 (59)	16 (38)	0.117
Mild Anxiety	19 (25)	18 (43)	
Moderate Anxiety	10 (13)	6 (14)	
Severe Anxiety	2 (2.6)	2 (4.8)	

COPD: Chronic Obstructive pulmonary disease.

Table **4** displays the correlation of lung function parameters with depression and anxiety scores. For asthma patients, there was no significant correlation of any of the pulmonary performance parameters with depression and anxiety scores.

For the COPD cohort, no significant correlation was found between lung function parameters and anxiety score. A significant weak negative correlation was seen for depression and FEV1% (r=-0.319, p=0.040), FVC (r=-0.411, p=0.007), and FEV1/FVC ratio (r=-0.345, p=0.025).

Table 4. Correlation of Lung Function Parameters with Depression and Anxiety Parameters for Asthma and COPD Patients.

Lung Disease	Lung Function	Mental Health Score	Correlation (spearman)	p-value
Asthma	FEV1	Anxiety Score	-0.118	0.309
	FVC	Anxiety Score	-0.132	0.256
	FEV1/ FVC Ratio	Anxiety Score	0.001	0.993
	FEV	Depression Score	0.109	0.347
	FVC	Depression Score	0.053	0.650
	FEV1/ FVC Ratio	Depression Score	0.208	0.072

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COPD	FEV1	Anxiety Score	-0.146	0.358
	FVC	Anxiety Score	-0.299	0.055
	FEV1/ FVC Ratio	Anxiety Score	0.054	0.732
	FEV1	Depression Score	-0.319	*0.040
	FVC	Depression Score	-0.411	*0.007
	FEV1/ FVC Ratio	Depression Score	-0.345	*0.025

COPD: Chronic obstructive pulmonary disease, FEV1: Forced Expiratory Volume in first second FVC: Forced Vital Capacity, *Significant at p<0.05.

DISCUSSION

In our study, 118 people with respiratory problems were evaluated. We found that depression was common. 90.5% of those with COPD and 85.5% of people with asthma were affected. The majority were moderately depressed. Also, anxiety affected 62% of COPD patients and 59% of asthma patients. The results of lung tests had little influence on how those with asthma felt. However, there was a slight but significant relationship between how well COPD patients' lungs functioned and how depressed they felt. Their lung function worsened as they felt worse. In Table **5**, we have summarized a comparison of key studies from both our region and the rest of the world.

Table 5. Summary of Study Findings from Different Similar Studies across the Globe.

Study (Author, Year)	Country	Sample Size	Methodology	Key Findings
Current study	Pakistan	118	Cross-sectional; asthma & COPD patients; HADS scale; spirometry correlation	Notable depression prevalence (Asthma 85.5%, COPD 90.5%) and anxiety burden (Asthma 59%, COPD 62%). No significant correlation of anxiety with spirometry. In COPD, depression showed significant weak negative correlation with FEV1%, FVC, and FEV1/FVC.
Husain *et al*., 2021	Pakistan	293	Cross-sectional; COPD; HADS; psychosocial evaluation	Depression prevalence ~51%; anxiety ~20%. Depression significantly associated with worse psychosocial outcomes. No strong correlation with lung function.
Liu *et al*., 2025	China	1,134	Validation study (PHQ-9/PHQ-2) in COPD	High prevalence of depressive symptoms; PHQ-9 reliable for COPD. Depressive symptoms increased with disease severity, but correlations with spirometry were weak.
Bansan *et al*., 2025	India	120	Cross-sectional; COPD; depression screening	High prevalence of depression (~60%). Severity tended to worsen with lower FEV1, but not always statistically significant.
Thapa *et al*., 2017	Nepal	120 COPD + controls	Cross-sectional; community-based	COPD patients showed significantly higher depression and anxiety vs general population. Lung function severity modestly associated with depression.
Chen *et al*., 2025	USA (NHIS dataset)	19,195 current asthma, 11,972 ever asthma, 200,293 never asthma	National survey analysis; adults with asthma	Depression and anxiety strongly associated with poor asthma control and increased allergic comorbidities. Associations independent of FEV1.
Nair *et al*., 2022	India	110	Cross-sectional; asthma; HADS	High prevalence of anxiety (45%) & depression (38%) among asthma patients. No consistent correlation with spirometry.
Stubbs *et al*., 2022	Australia	373	Severe asthma cohort; psychological scales; lung function	Anxiety & depression strongly associated with poor asthma control and dyspnoea. Lung function had no significant direct correlation.
Ogbu *et al*., 2023	USA	5,677	NHANES-based latent class analysis	Poor mental health clusters strongly predicted uncontrolled asthma. Spirometry did not directly correlate with depression/anxiety.

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Özcan *et al*., 2015	Turkey	150	Comparative; asthma vs COPD	Depression & anxiety more common in COPD vs asthma. No clear spirometry correlation.
Hometowska *et al*., 2022	Poland	385	Cross-sectional; COPD, asthma, ACO	Fatigue, depression & anxiety higher in COPD & ACO vs asthma. Relationships with lung function weak or absent.
Karlsen *et al*., 2024 (Systematic Review)	Denmark	25 studies	Systematic review	Concluded that evidence for lung function correlating with anxiety/depression in COPD is weak and inconsistent.

The primary aim of our study was to determine the prevalence of depression and anxiety in obstructive lung diseases, including asthma and COPD. In this study prevalence of depression in COPD patients was 90.5%, with moderate depression being the most frequent depression level. In contrast to our findings, another Pakistani survey reported a lower prevalence of depression in COPD patients than our study (51%) [22]. When carrying out the study, the study setting is highlighted as important, as it brings heterogeneity in results among the study. Although the study population was the same, the study setting was different, which possibly accounted for larger variations between the studies. Our study was performed in specialized pulmonology outpatient clinics where presenting cases may be more severe or referrals, whereas the other two studies were primary facility and among intensive care admitted patients, which could be the possible cause of heterogeneous findings. Some other similar surveys reported a depression prevalence of 11.7% from China [23], 45% from India [24], and 95.7% from Nepal [25].

This study demonstrated a depression prevalence of 85.5% in asthma patients. Another Pakistani reported a 60.7% depression burden in asthmatic patients [26]. Reported prevalence of depression in asthma patients from China, India, Australia, and the US is 13.8%, 22%, 26%, and 27.8%, respectively [27-30]. Interestingly, other regions have consistent prevalence rates except for China, which showed the lowest burden among other regions. The higher prevalence in our study could be attributed to different demographic factors and ongoing financial struggle throughout the country. This finding underscores the urgent need of integrating mental health screening and referrals for proper counselling and treatment of underlying mental disorders in OLD patients.

In our study 85.5% of asthma and 90.5% of COPD patients had depression. Nearly a quarter of asthma patients had mild depression, whereas one-fifth of COPD patients had depression. Moderate depression level was common both in asthma and COPD patients. While few asthma and COPD patients had severe depression. Overall, the finding depicts that depression was more frequently seen in COPD cases than in asthma patients, but it did not reach statistical significance, maybe due to the limited sample size. Existing literature consistently shows that COPD patients are more likely to be depressed than asthma patients [8, 31, 32]. In asthma patients, airflow obstruction within the lung is often reversible either spontaneously or with treatment. On the other hand, airflow limitation is usually progressive and not fully reversible in COPD patients. Moreover, COPD commonly affects the elderly population, whereas asthmatic patients are relatively younger than COPD patients with strong resilience power, which may result in lesser depression in asthma [33].

In this study anxiety was prevalent in 62% of COPD patients. Yohannes AM, reports that anxiety prevalence in COPD patients ranges from 13% to 46% in outpatient settings and 10% to 55% among inpatients [34]. The heterogeneity among studies is obvious because of regional differences in population features, healthcare systems, social factors, and different methods used for screening. However, the anxiety burden around two-thirds of patients in our study highlights the gravity of addressing mental health needs in our local population.

The anxiety burden in asthma patients was 41%, with a quarter having minimal anxiety and few having severe anxiety. Having mild anxiety is also a serious concern, as it may change to moderate to severe anxiety with disease progression. A lower anxiety burden in asthma patients was reported from India (22%) [28]. A lower prevalence was reported from Saudi Arabia (38%) [35], and a higher prevalence was reported from Turkey (60%) [36]. While a similar finding was reported from Poland, 40.8% [32].

In this study minimal anxiety was higher in asthma patients than those having COPD (59% versus 38%). While mild anxiety was seen in one-fourth of asthma patients and more than one-third of COPD patients. Even the prevalence of moderate and severe anxiety was higher in COPD patients (4.8% versus 2.6%). However, these differences were found to be non-significant. But as we have seen with depression, anxiety is also consistently reported to be higher in COPD patients than asthma patients [31, 32].

The secondary objective of this study was to determine the correlation of spirometry parameters with anxiety and depression. No correlation was seen for anxiety and depression with any of the lung function parameters in this study for the subgroup of asthma. This might be possible because asthma is a more controlled disease than COPD, depicting variables of symptoms depending on the environment and weather. So, spirometry evaluation at a single point, particularly in a normal state, may not reflect the lung function incapability appropriately, due to which there was no association found for lung function parameter with anxiety and depression score.

In contrast, a significant weak correlation in the inverse direction was seen with all pulmonary function parameters with depres-

sion scores in the cohort of COPD patients. This simply depicts increasing depression as related to worse lung function. However, the weak correlation indicates there may be other factors that could explain the variation in lung function parameters, possibly disease severity, comorbidity, and patients' age. This finding is consistent with a systematic review that analyzed 37 studies and found that there was a negative correlation of depression score with FEV1% in 15 studies. The pooled correlation was based on 8 studies' estimates, which were very weak and negative (r=-0.173, p=0.026). But overall, no correlation was found between anxiety and FEV1%, FVC, and FEV1/FVC ratio [37]. The possible explanation is the fact that COPD is a chronic disease in which depression is common. In contrast, anxiety is a subjective assessment that may alter the breathing patterns with panic attacks, but it does not impact lung functions biologically.

LIMITATIONS

The present study suffers with few serious limitations. It was single center study with a limited sample size. The study was cross-sectional in nature which does not guarantee the temporality and causality. Although spirometry was repeated three times but the test was performed at the same under the same conditions which may not symbolize the true lung function status. Because of these limitations, the generalizability is not possible. It is suggested to validate the study findings for our local population with a larger sample size and multi-center investigation.

CONCLUSION

Anxiety and depression are common in people with obstructive lung disease who also have asthma or COPD. This result emphasizes the necessity of routinely screening for anxiety and depression in order to alleviate the psychological burden among patients with COPD and asthma. Furthermore, a strong inverse link between depression and lung function measures highlights the need for continuous treatment plans to take psychological factors into account in order to enhance COPD therapy.

ABBREVIATIONS

COPD: Chronic Obstructive Pulmonary Disease.

FEV1: Forced Expiratory Volume in First Second.

FVC: Forced Vital Capacity.

PHQ: Patient Health Questionnaire.

GAD: General Anxiety Disorder.

AUTHORS' CONTRIBUTION

Ehab Nabeel: Conceptualization, Writing draft, Final approval, final proof to be published.

Sohail Akhtar: Study design, Critical review and revision the manuscript, Final approval, final proof to be published.

Ahmed Ali: Writing draft, Final approval, final proof to be published.

Syed Wajahat Hussain: Methodology, Data analysis and interpretation, Final approval, final proof to be published.

Mujahid Hussain: Writing draft, Methodology, Data analysis and interpretation, Final approval, final proof to be published.

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ETHICAL DECLARATIONS

Data Availability Statement

Data will be available from the corresponding author upon a reasonable request.

Ethical Approval

The study was commenced with the approval of Institutional Review Board bearing letter number IHHN_IRB_2024_03_018, dated December 13, 2024.

Consent to Participate

Informed consent was obtained from all patients for inclusion in the study.

Consent for Publication

All authors give consent for the publication of this work.

Conflict of Interest

Declared none.

Competing Interest/Funding

Declared none.

Use of AI-Assisted Technologies

The authors declare that no generative artificial intelligence (AI) or AI-assisted technologies were utilized in the writing of this manuscript, in the creation of images/graphics/tables/captions, or in any other aspect of its preparation.

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